

## INCORPORATION OF FRUIT COATINGS INTO QUARANTINE SECURITY SYSTEMS

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Fruit coatings have been shown to provide significant mortality to fruit fly immatures inside of fruits and have combined positively with other quarantine treatments (Hallman et al. 1994, Hallman et al. 1995, Hallman and Foos 1995, Hallman 1995). Coatings are believed to kill fruit fly immatures by functioning as modified atmospheres reducing oxygen levels inside of fruits and raising carbon dioxide levels. Increased levels of products of anaerobic respiration may contribute to mortality. Coatings vary in toxicity to fruit fly immatures in fruits. Although levels of mortality as high as 100% of Caribbean fruit fly in grapefruits (Sta-Fresh 600) have been reached in tests, it seems unlikely that a coating by itself would be sufficient to provide complete quarantine security against fruit flies (Hallman et al. 1994). Coatings would probably not kill most third instars mature enough to exit the fruit. Grapefruits infested with Mexican fruit fly and coated with Nature Seal 2020 (a moderately toxic coating) resulted in 54% mortality to eggs and early instars and only 12% to third instars. However, the surprisingly high levels of mortality found with some coatings suggest that they may be combined with other treatments to produce quarantine security or incorporated into quarantine security systems where each component of the system reduces the risk of pest introduction.

Hot air treatments could be shortened considerably if the fruit were coated prior to treatment. Hallman et al. (1994) achieved 100% Caribbean fruit fly mortality in coated (Nature Seal with 2% methyl cellulose and 10% shellac) grapefruits treated with forced hot air at 48°C after one hour versus two hours for uncoated grapefruits. Some countries, such as Australia, use postharvest insecticide dips as quarantine treatments. Dimethoate incorporated into coatings increased Caribbean fruit fly mortality in grapefruits by 93-99% compared with coatings or dimethoate alone (Hallman and Foos 1995). Coatings did not increase the efficacy of cold storage or methyl bromide fumigation treatments in the limited instances tested (Hallman et al. 1994, Hallman 1995).

Nature Seal with 4% hydroxypropyl cellulose applied to guavas reduced natural Caribbean fruit fly survival rates by 91% (Hallman et al. 1995). This reduction in survival may allow for other quarantine treatments to be applied to guavas shipped from Florida to California. California presently demands that Caribbean fruit fly infestation rates in guavas not exceed 1% prior to hot water immersion quarantine treatment.

The Florida Department of Agriculture is studying the possibility of incorporating

coatings into the Caribbean fruit fly-free protocol for grapefruits shipped to Japan. The commonly-used citrus coating, Sta-Fresh 360HS, caused 88-91% Caribbean fruit fly mortality in 'Marsh' white grapefruits.

Coatings may also work with other internal pests, quarantine treatments, and commodities and should be further studied. It is a benign treatment in that coatings are already being used to preserve market quality and are made of ingredients generally considered safe for humans.

#### References

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